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NASA/SP—1999-7011/SUPPL482
January 11, 1999

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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53 Behavioral Sciences 6

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54 Man/System Technology and Life Support 7

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55 Space Biology 11

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Typical Report Citation and Abstract

1. 19970001126 NASA Langley Research Center, Hampton, VA USA
2. Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
3. Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA
4. Mar. 1996, 130p; In English
5. Contract(s)/Grant(s): RTOP 505-67-70-04
6. Report No(s): NASA-TM-4663, NAS 1.15:4663, L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
7. To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-In./ft Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cut-out wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
8. Author
9. *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number, Corporate Source
2. Title
3. Author(s) and Affiliation(s)
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6. Report Number(s); Availability and Price Codes
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8. Abstract Author
9. Subject Terms

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 482)

JANUARY 11, 1999

51
LIFE SCIENCES (GENERAL)

19990004115 Scripps Institution of Oceanography, Marine Biology Research Div., La Jolla, CA USA
An Experimental-Numerical Study of Small Scale Flow Interaction with Bioluminescent Plankton: *Final Report, 1 Oct. 1994 - 31 Mar 1998*
Latz, Michael I., Sep. 04, 1998; 8p; In English
Contract(s)/Grant(s): N00014-95-1-0881
Report No.(s): AD-A353907; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Numerical and experimental approaches were used to investigate the effects of quantified flow stimuli on bioluminescence stimulation at the small length and time scales appropriate for individual plankton. Bioluminescence was used as a sensitive tool for examining essentially instantaneous organism response. Based on laboratory work with defined flow fields, a consistent picture of organism response emerges. There is a response threshold in laminar flow at a shear stress level of approximately 0.1 N/sq m. Increasing shear stress levels lead to increased population response due to more organisms being stimulated, and to a lesser extent increases in the magnitude of the individual response, which is maximized in high laminar flow. Responsiveness is a function of shear stress, not the laminar or turbulent nature of the flow. The boundary layers of most moving objects of Naval interest contain stimulatory levels of shear stress. The present results indicate that their bioluminescence signature will depend on boundary layer thickness and the amount of flow separation. Prop-4 findings are relevant to the concerns of nighttime covert operations, and relate to recent interest in applying hyperspectral and multispectral technologies to ocean surveillance.
DTIC
Plankton; Laminar Flow; Pipe Flow; Bioluminescence; Oceans; Separated Flow; Shear Stress; Stimulation

19990000636 NASA Marshall Space Flight Center, Huntsville, AL USA
Crystallization of Chicken Egg-White Lysozyme from Ammonium Sulfate
Forsythe, Elizabeth L., Universities Space Research Association, USA; Snell, Edward H., NASA Marshall Space Flight Center, USA; Pusey, Marc L., NASA Marshall Space Flight Center, USA; Acta Crystallographica Section D; 1997; ISSN 0907-4449; Volume D53, pp. 795-797; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Chicken egg-white lysozyme was crystallized from ammonium sulfate over the pH range 4.0-7.8, with protein concentrations from 100 to 150 mg/ml. Crystals were obtained by vapor-diffusion or batch-crystallization methods. The protein crystallized in two morphologies with an apparent morphology dependence on temperature and protein concentration. In general, tetragonal crystals could be grown by lowering the protein concentration or temperature. Increasing the temperature or protein concentration resulted in the growth of orthorhombic crystals. Representative crystals of each morphology were selected for X-ray analysis. The tetragonal crystals belonged to the P4(sub 3)2(sub 1)2 space group with crystals grown at pH 4.4 having unit-cell dimensions of a = b = 78.7 A, c=38.6 A and diffracting to beyond 2.0 A. The orthorhombic crystals, grown at pH 4.8, were of space group P2(sub 1)2(sub 1)2 and had unit-cell dimensions of a = 80.51, b = 86.51 and c = 73.62 A.
Author
Eggs; Lysozyme; Crystallization; Crystal Growth; Proteins

19990000129 Norwegian Defence Research Establishment, Div. for Environmental Toxicology, Kjeller, Norway
Several Oximes (HI6/OBIDOXIM, HI-6 HLO-7, P2S and 2-PAM) Effect on Potassium Evoked Release of (H-3)-Acetylcholine and Liberation of (H-3)-Choline from Rat Hippocampii: The Search for a Therapeutic Agent Against Soman (GD) Poisoning
Oydvin, Ole Kristian, Norwegian Defence Research Establishment, Norway; Jun. 15, 1998; 108p; In English

Contracts/Grants: FFITOX Proj. 718/137
Report No.(s): FFI/RAPPORT-98/04243; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The work in this investigation was performed to compare the ability of different oximes to alter the release of acetylcholine from nervous tissue both previous to, and after, inhibition with the cholinesterase inhibitor soman. The aim was to find out which of the oximes used that had the best potential as an antidote against nerve agent intoxication in spite of the absence of reactivation properties of the oximes. The tissue used was rat hippocampi, and the potassium (51 mM) evoked release [H-3]-ACh and the liberation of [H-3]-Ch were measured. The recently developed oxime HLo-7 exerted the strongest effect in the absence of soman closely followed by toxogonin. HI-6 also significantly elevated the stimulated release of[H-3]-ACh, although much less than HLo-7 and toxogonin. Experiments performed following complete inhibition of the cholinesterases showed that HLo-7 induced a significant decrease [H-3] in the amount of released [H-3]-ACh, and an even larger significant increase in the amount of liberated HI-Ch. HI-6 were also shown to exert a quite significant effect although this was only seen in an increased amount of liberated [3-H]-Ch. Toxogonin gave, as for HI-6, some effect on the amount of [H-3]-Ch detected, although this effect was much less pronounced. The pralidoximes (P2S and 2-PAM) showed in all experiments only marginal effects. According to this work, the oxime which seems to have the best potential as an antidote against soman poisoning (due to the significant decrease in amount of stimulated release of [H-3] ACh observed) is HLo-7. HI-6 also seems to have promise. Toxogonin, and the pralidoximes P2S and 2-PAM, did not show any effects comparable to the effects of the two previously mentioned oximes.
Author
Potassium Isotopes; Hydrogen Ions; Research; Acetyl Compounds

[9900009371] Meiji Univ., School of Science and Technology, Kawasaki
On the Origin of a Split EPR Signal from a Modified S3'(sub 3)-State of Ca(2+)-Depleted Photosystem II in Plants
Kusunoki, Masami, Meiji Univ., Research Reports of the School of Science and Technology, Meiji University; 1996; ISSN 0916-4944, No. 14(70), pp. 51-76; In English
Report No.(s): VII-2; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

An effective spin hamiltonian that can properly describe the isotropic exchange and magnetic dipolar interactions between a Mn-tetramer with total spin S(sub 1) = 1/2 and its ligand radical with spin S(sub 2) = 1/2, i.e., J(sub 12)S(sub 1) central dot S(sub 2)I and S(sub 1) central dot D(sub 12) central dot S(sub 2) respectively, has been quantum-mechanically derived to elucidate the origin of a new type of EPR signals from the modified-S(sub 3)(S'(sub 3) state of Ca(2+)-depleted photosystem II (PS II) membranes. This signal, called "S'(sub 3) signal", is centered at $g = 2.004$ and notably consists of a main doublet component having a near-symmetric lineshape with the linewidth of 100- 200 G and a secondary wing component asymmetrically extending over approx. = 910 G without any hyperfine structure. From results of computer simulation of the S'(sub 3) signal, combined with the pulsed EPR data, it follows: (1) the Mn4-radical complexes in the S'(sub 3) state must be highly inhomogeneous; (2) the majority (approx. = 77 %) would be EPR-silent possibly because of no detectable magnetic moment due to J(sub 12) much greater than k(sub B)T (temperature), and (3) the minority would exhibit an EPR signal mainly contributing to the doublet (approx. 15 %) or wing (approx. 8 %) component in the S'(sub 3) signal according as absolute value of J(sub 12) approx. = 100- 200 G or absolute value of J(sub 12) much greater than 100-200 G (together with an additional condition, J(sub 12) less than k(sub B)T, when J(sub 12) greater than 0), respectively, indicating the radical could be neither an oxidized histidine nor tyrozine Y(sub Z, sup +) but some bridging ligand; (5) the doublet component can arise only from the weakly-coupled Mn4-radical complexes satisfying the conditions for a small near-isotropic interaction (absolute value of J(sub 12) approx = 100-200 G much greater than absolute value of D(sub 12) and having the tetrameric effective Mn-spins with appreciable hyperfine coupling constants, indicating the radical must form the third asymmetrically-bridging ligand between di(mu-oxo) bridged Mn(a)(III) and Mn(b)(IV) ions on the opposite side of the other pair of Mn(c)(IV) and Mn(d)(IV) ions in an asymmetric Mn-tetramer whose spin state is approximately given by psi(sub 1)(1/2 M) = cos theta(sub 0)/S(sub a)(1/2, M greater than + sin theta(sub 0)/S(sub a)(1/2)S(sub c,d)(1)S(sub 1)(1/2, M greater than with theta(sub 0) approx. = -62 deg approx. 65 deg, and (7) the radical takes the g-value of ca. 2.011, which is much larger than the free electron g-value (g(sub e) = 2.0023), nearly equal to that of OH center dot (approx. = 2.011) and slightly less than that of O2(-) (approx = 2.015),indicative of an oxygen-rich moiety rather than an aromatic amino acid. These findings, together with the reported stoichiometry of protons released during the normal S-state cycle, evidently suggest that the radical as the primary water-oxidation product would be most likely (HO(-)(a)HO(sup .)) or (HOOH(sup -)(a)(-)), being bound on the catalytic microsurface of the di(mu-oxo)Mn2(III,IV) subunit in both the normal and the modified S(sub 3) states.
Author
Amino Acids; Computerized Simulation; Hamiltonian Functions; Hyperfine Structure; Magnetic Effects

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19990064068 Army Aeromedical Research Lab., Fort Rucker, AL USA

The Effects of Exercise as a Countermeasure for Fatigue in Sleep Deprived Aviators *Final Report*

LeDuc, Patricia A.; Army Aeromedical Research Lab., USA; Caldwell, John A., Jr.; Army Aeromedical Research Lab., USA; Ruyak, Peggy S.; Army Aeromedical Research Lab., USA; Prazinko, Brian; Army Aeromedical Research Lab., USA; Gardner, Susan; Army Aeromedical Research Lab., USA; Aug. 1998; 39p; In English

Contract(s)/Grant(s): Proj-3016278?A879

Report No.(s): AD-A354133; USAARL-98-35; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study was designed to examine the efficacy of a nonpharmacological intervention, exercise, for sustaining performance despite a moderate amount of sleep loss. Twelve subjects were individually tested during two, 40-hour periods of sleep deprivation. Volunteers engaged in 10-minute bouts of exercise during one period and rested for an equivalent amount of time during the other period. Data included electroencephalography, Repeated Tests of Sustained Wakefulness, and Visual Analog Scale. Subjective changes in mood were examined using the Profile of Mood States. Cognitive evaluations were measured using the Multi Attribute Task Battery and Synthetic Work Battery. Flight performance was measured using the MINISIM, a flight simulation task. The results of this study indicate that exercise does have short-term alerting effects in sleep deprived subjects. Subjects were more alert immediately following exercise as evidenced by longer latencies to stage 2 sleep than when they did not exercise during sleep deprivation. However, the alerting effects of exercise were very short lived. EEG data collected 50 minutes following exercise or rest showed that exercise facilitated increases in slow-wave activity (signs of decreased alertness) above those seen during rest. Cognitive deficits and slowed reaction times associated with sleep loss were equivalent in both the exercise and rest conditions. Taken together, the results from this study suggest that exercise may ameliorate some of the increases in sleepiness and fatigue associated with sleep loss for a short period of time (30 min) but will not prevent performance decrements. Additionally, less than one hour following exercise, significant increases in fatigue and sleepiness may occur.

DTIC

Sleep Deprivation; Physical Exercise; Alertness; Electroencephalography; Wakefulness; Performance Tests

19990064098 Medical Coll. of Georgia, Augusta, GA USA

Chronic Organophosphorus Exposure and Cognition *Annual Report, 15 Apr 1996 - 14 Apr 1997*

Buccafusco, Jerry J.; May 1997; 25p; In English

Contract(s)/Grant(s): DAMD17-95-1-5036

Report No.(s): AD-A354416; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Protracted exposure to low levels of organophosphorus (OP) compounds impairs acetylcholine degradation by acetylcholinesterase (AChE) and, in humans, may produce lasting neurotoxicity affecting cognitive function. The present studies examined the ability of such exposure to impair performance of novel or well-learned cognitive-related tasks in rats. Withdrawal from the chronic exposure to a low-dose regimen of diisopropyl- fluorophosphate (DFP; 0.25 mg/day/14 days) impaired novel navigational learning acquisition, but did not impair performance of a RE-learning phase of the same task. The DFP regimen also did not significantly impair performance of rats who were well-trained in a delayed discrimination task. These data indicate that performance of memory tasks dependent upon reference concepts is not impaired by OP exposure regimens shown to impair acquisition of novel cognitive tasks prior to the onset of overt toxicity. to help explain the protracted impairment observed during the acquisition of a novel cognitive related task, brains were harvested 7 or 16 days after completion of the DFP or saline (control) regimen and coronal sections were subjected to quantitative muscarinic and nicotinic cholinergic receptor autoradiography. Both and nicotinic densities were decreased in several regions in the 7 day sections. by 16 days all differences had resolved except for a continued 42% decrease in hippocampal dentate nicotinic receptor expression. Thus, OP AChE inhibitors may, after chronic low-level exposure, produce a degree of subtle brain damage underlying impaired working memory and reduced expression of hippocampal nicotinic receptor expression.

DTIC

Organic Phosphorus Compounds; Brain Damage; Physiological Effects; Cognition; Acetyl Compounds; Cholinesterase; Degradation; Toxicity

19990065982 Institute for Human Factors TNO, Soesterberg, Netherlands

Motion Sickness: Only One Provocative Conflict? *Interim Report Bewegingziekte: Slechts een Provocatieve Conflict?*

Bles, W., Institute for Human Factors TNO, Netherlands; Bos, J. E., Institute for Human Factors TNO, Netherlands; deGraaf, B.,

Institute for Human Factors TNO, Netherlands; Groen, E., Institute for Human Factors TNO, Netherlands; Wertheim, A. H., Institute for Human Factors TNO, Netherlands, May 27, 1998, 19p, In English
Contract(s)/Grant(s): A92/KLu/331; TNO Proj. 789.3
Report No.(s): TNO-98-A033; TD98-0242; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 de Soesterberg, The Netherlands), Hardcopy, Microfiche

In reviewing the various forms of motion sickness the classical sensory rearrangement theory has been redefined by demonstrating that only one type of conflict is necessary and sufficient to explain all different kinds of motion sickness. A mathematical description is provided from the summarizing statement that "Situations which provoke motion sickness are characterized by a condition in which the sensed vertical as determined on the basis of integrated information from the eyes, the vestibular system and the non-vestibular proprioceptors is at variance with the subjective vertical as expected from previous experience".
Author
Motion Sickness; Proprioceptors; Mathematical Models

19990007983 Institute for Human Factors TNO, Soesterberg, Netherlands
Coriolis Effects and Motion Sickness Modelling. *Interim Report Coriolis Effecten en het Modelleren van Bewegingsziekte*
Bles, W., Institute for Human Factors TNO, Netherlands, Mar. 03, 1998, 19p, In English
Contract(s)/Grant(s): A92/KLu/331; TNO Proj. 789.3
Report No.(s): TNO-TM-98-A034; TD98-0243; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

Coriolis effects are notorious in relation to disorientation and motion sickness in aircrew. A review is provided of experimental data on these Coriolis effects, including the modulatory effects of adding visual or somatosensory rotatory motion information. A vector analysis of the consequences of head movements during somatosensory, visual and/or vestibular rotatory motion stimulation revealed that the more the sensed angular velocity vector after the head movements is aligned with the gravito-inertial force vector, the less nauseating effects are experienced. It is demonstrated that this is a special case of the Subjective Vertical conflict theory on motion sickness which assumes that motion sickness may be provoked if a discrepancy is detected between the subjective vertical and the sensed vertical as determined on the basis of incoming sensory information.
Derived from text
Motion Sickness; Sensory Perception; Vertical Motion; Disorientation; Coriolis Effect; Flight Crews; Angular Velocity

19990007752 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Physical Work and Cognitive Function During Acute Heat Exposure Before and After Heat Acclimation
Patterson, Mark J., Defence Science and Technology Organisation, Australia; Taylor, Nigel A. S., Defence Science and Technology Organisation, Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Jun. 1998, 39p, In English
Report No.(s): DSTO-TR-0683; DODA-AR-010-569; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Australia), Hardcopy, Microfiche

Eight physically active males, without a history of heat acclimation were studied during heat exposure for 22 consecutive days. Physiological adaptation and cognitive function were evaluated during heat stress tests. Four cognitive function tests were administered at intervals during the study. These tests involved assessment of perceptual function, spatial orientation, temporal orientation and vigilance. The observations show that heat acclimation improves the capacity to perform physical work in the heat. However, neither unfamiliar nor habitual heat strain appear to induce attentional disturbances, temporal or spatial disorientation, or altered visual perception, as quantified within this experimental design. While these data indicate that cognitive function is not affected by heat, it is possible that the cognitive function tests used were not sufficiently sensitive to quantify heat-induced impairment. It is also possible that changes may only appear in more complex cognitive tasks.
Author
Heat Tolerance; Heat Acclimatization; Physical Work; Physiological Responses; Disorientation; Work Functions; Temperature Effects; Stress Measurement; Mental Performance

19990007943 Civil Aeromedical Inst., Oklahoma City, OK USA
The Aeromedical Certification of Photorefractive Keratectomy in Civil Aviation: A Reference [illegible] Final Report
Nakagawara, Van B., Civil Aeromedical Inst., USA; Wood, Kathryn J., Civil Aeromedical Inst., USA; Sep. 1998, 54p, In English
Contract(s)/Grant(s): AM-B-98-TOX-203
Report No.(s): DOT/FAA/AM-98/25; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The use of surgery to correct refractive errors continues to evolve at a significant pace. Radial keratotomy (RK), the first widely accepted refractive surgical procedure, involves making radial incisions on the peripheral cornea. These incisions weaken

the cornea and allow intraocular pressure to push the peripheral cornea out, flattening the apex and reducing refractive power. There are many disadvantages with RK that raise concerns regarding its use in the aviation environment. These include: progressive hyperopic shifts, reduced corneal strength, fluctuation of vision, glare, poor refractive predictability and altitude-induced corneal changes. In October 1995, the Food and Drug Administration approved the use of the excimer laser to perform photorefractive keratectomy (PRK) to reshape the anterior curvature of the cornea. Since that time, PRK has become the refractive surgical procedure of choice. It has been reported that for low to moderate levels of myopia there is greater predictability, no fluctuation of vision or reduction in corneal strength, and about 85% of patients have uncorrected visual acuity of 20/40 or better. As with RK, there are aspects of PRK that raise concerns about its use in the aviation environment. Some of these include: night vision problems (e.g., glare, halos around lights, haze, starbursts, and dim lighting difficulties), reduced contrast sensitivity, stability of refraction, reduced best-corrected visual acuity, and induced anisometropia. Using a mathematical model, it was estimated that by the year 2000 there may be over 1,200 civil airmen who elect to have PRK performed. to provide the aeromedical community with information to formulate administrative decisions and policies associated with this new refractive surgical procedure, this paper reviews the results of clinical trials on PRK and discusses its applicability in aviation.
Author
Aerospace Medicine; Refractivity; Surgery; Excimer Lasers; Refraction; Cornea

19990008171 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering (Hangtian Yixue yu Yixue Gongcheng)
Wei, Jinhe, Editor, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Feb. 1998; ISSN 1002-0837; Volume 11, No. 1; 88p; In English
Report No.(s): PB99-109100; CN 11-2774/R; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche

Partial contents: Effect of Hypoxia on Motion Sickness Induced by Optokinetic Stimulation (In English); A study on EEG - Encephalofluctuographic Characteristics in alpha Frequency Band in Pilots; Studies on the Solvent Structure in Protein Crystals Grown in Microgravity; Application of the Sphygmogram in Evaluation of Pilots Cardiovascular Function in Resting Condition; Analysis of Heart Rate Variability in Chinese Healthy Pilot; Reliability Design and Analysis of Man - Machine Performance of Display and Illumination System in Cockpit.
NTIS
Aerospace Medicine; Hypoxia; Electroencephalography; Solvents; Heart Rate; Reliability

19990008218 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering (Hangtian Yixue yu Yixue Gongcheng)
Wei, Jinhe, Editor, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 1997; ISSN 1002-0837; Volume 10, No. 6; pp. 390-468; In English
Report No.(s): PB99-108987; CN 11-2774/R; Copyright Waived; Avail: CASI; A06, Hardcopy; A02, Microfiche

Partial contents: Dual Reciprocity Boundary Element Method for Solving Thermal Wave Model of Biological Transfer (In English); An Analysis of Radiation Risk for Manned Space Flight in Low - earth Orbits with Medium Inclination; Observation of EGG Parameters during - otsup astr o Head - down Bedrest for 21 Days; Simulation of a Decoupling Generalized Predictive Control Algorithm for Temperature-Humidity System; A Study on Three Dimensional Modeling of Human Body in Man - machine System Simulation.
NTIS
Aerospace Medicine; Boundary Element Method

19990008220 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering (Hangtian Yixue yu Yixue Gongcheng)
Wei, Jinhe, Editor, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1998; ISSN 1002-0837; Volume 11, No. 2; pp. 79-156; In English
Report No.(s): PB99-108992; CN 11-2774/R; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche

Partial contents: Alteration of Vasoreactivity of Mesenteric Arteries in Rats after Two-Week Simulated Weightlessness (In English); An Internet Based Medical Communication Server; Bispectral Analysis of EEG Signal during Focal Cerebral Ischemia; Study on Comprehensive Assessment in Selection of Special Work Personnel; Effects of Hypoxia and Qigong on Urine Malondialdehyde, Superoxide Dismutase and Circulating Endothelial Cell in Humans during Simulated Weightlessness.
NTIS
Aerospace Medicine; Arteries; Internets

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19990004134 Texas Univ., Center for Vision and Image Sciences, Austin, TX USA
Local Spatio-Temporal Analysis in Vision Systems. *Final Report, 1 May 1993 - 31 May 1998*
Geisler, W. S.; Bovik, A. C.; Cormack, L. K.; Gilden, D. L.; Super, B. J.; Sep. 1998; 29p; In English
Contract(s)/Grant(s): F49620-93-1-0337
Report No.(s): AD-A353750; AFRL-SR-BL-TR-98-0641; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is the final progress report of teh vision group at the University of Texas under support of AFOSR URI grant F49620-93-1-0337. In the report we will attempt to summarize the major accomplishments over the previous 5 years. Aim 1: to develop a mathematical model of the initial stages of visual processing (the front end mechanisms), based upon a wide range of physiological and psychophysical data. Aim 2: to develop new methods and models of local frequency coding. Aim 3: to develop new mathematical models and computer-vision algorithms for performing complex visual tasks that are based upon local frequency coding representations. Aim 4: to develop models for human performance in complex visual tasks that build upon current understanding of the front-end mechanisms. Aim 5: to develop a computational testbed for implementing, comparing, integrating and visualizing the different models and modules developed during the project, using a massively parallel machine and graphics workstation front-end.
DTIC
Mathematical Models; Visual Perception; Computer Vision; Parallel Processing (Computers); Physiology; Visual Tasks

19990004630 Civil Aeromedical Inst., Oklahoma City, OK USA
Summative Evaluation of the Collegiate Training Initiative for Air Traffic Control Specialists Program: Progress of Minnesota Air Traffic Control Training Center Graduates in En Route Field Training. *Final Report*
Broach, Dana; Civil Aeromedical Inst., USA; Aug. 1998; 70p; In English
Contract(s)/Grant(s): FAA-AAM-97-B-HRR-133
Report No.(s): DOT/FAA/AM-98/22; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This summative evaluation of the Collegiate Training Initiative for Air Traffic Control Specialists focused on the progress of the Minnesota Air Traffic Control Training Center (MnATCTC) graduates in en route field training. The evaluation compared 136 MnATCTC graduates with 157 FAA Academy graduates on 4 classes of measures: (a) diversity; (b) progress in training at the first assigned field facility; (c) attrition from the first assigned field facility; and (d) performance ratings at the first assigned facility. A cost-benefit analysis for the MnATCTC program was also conducted. There were significantly more women in the MnATCTC (40%) than in the FAA Academy group (17%); there were no significant differences in minority representation. Just 17% of the MnATCTC had achieved full performance level (FPL) certification as of June 1995, compared with 69% of the FAA Academy group. However, time to FPL and attrition rates were similar. MnATCTC graduates were rated significantly lower than FAA Academy graduates by supervisors in teamwork, technical skill, technical knowledge, and overall potential to succeed in the ATCS occupation. Cost analysis found that MnATCTC per-hire costs would be competitive with FAA Academy costs-per-student by FY1998-2000. Cost-benefit analysis found that the MnATCTC would begin returning about $1.45 in avoided costs and savings to the agency for every $1 invested by FY1998-2001, even with continued FAA financial support. However, with a maximum capacity of about 100 graduates per year, the MnATCTC can provide only a small fraction of the FAA controller workforce. In summary, this evaluation found that the MnATCTC program appears to be achieving its stated goals.
Author
Training Evaluation; Air Traffic Controllers (Personnel); Students; Education; Certification

19990007983 NASA Ames Research Center, Moffett Field, CA USA
Rotational Translational Components of Motion Parallax: Observers' Sensitivity and Implications for Three-Dimensional Computer Graphics
Kaiser, Mary K., NASA Ames Research Center, USA; Montegut, Michael J., NASA Ames Research Center, USA; Proffitt, Dennis R., Virginia Univ., USA; Journal of Experimental Psychology: Applied; 1995; Volume 1, No. 4, pp. 321-331; In English; No Copyright; Avail: Issuing Activity; Hardcopy; Microfiche

The motion of objects during motion parallax can be decomposed into 2 observer-relative components: translation and rotation. The depth ratio of objects in the visual field is specified by the inverse ratio of their angular displacement (from translation) or equivalently by the inverse ratio of their rotations. Despite the equal mathematical status of these 2 information sources, it was predicted that observers would be far more sensitive to the translational than rotational component. Such a differential sensitivity

is implicitly assumed by the computer graphics technique billboarding, in which 3-dimensional (3-D) objects are drawn as planar forms (i.e., billboards) maintained normal to the line of sight. In 3 experiments, observers were found to be consistently less sensitive to rotational anomalies. The implications of these findings for kinetic depth effect displays and billboarding techniques are discussed.
Author
Parallax; Translational Motion; Visual Fields; Computer Graphics

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19990004380 Colorado Univ., Boulder, CO USA
Modeling, Monitoring and Fault Diagnosis of Spacecraft Air Contaminants *Final Report*
Ramirez, W. Fred, Colorado Univ., USA; Skliar, Mikhail, Colorado Univ., USA; Narayan, Anand, Colorado Univ., USA; Morgenthaler, George W., Colorado Univ., USA; Smith, Gerald J., Colorado Univ., USA; 1998; 160p; In English
Contract(s)/Grant(s): NAGw-4585; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Control of air contaminants is a crucial factor in the safety considerations of crewed space flight. Indoor air quality needs to be closely monitored during long range missions such as a Mars mission, and also on large complex space structures such as the International Space Station. This work mainly pertains to the detection and simulation of air contaminants in the space station, though much of the work is easily extended to buildings, and issues of ventilation systems. Here we propose a method with which to track the presence of contaminants using an accurate physical model, and also develop a robust procedure that would raise alarms when certain tolerance levels are exceeded. A part of this research concerns the modeling of air flow inside a spacecraft, and the consequent dispersal pattern of contaminants. Our objective is to also monitor the contaminants on-line, so we develop a state estimation procedure that makes use of the measurements from a sensor system and determines an optimal estimate of the contamination in the system as a function of time and space. The real-time optimal estimates in turn are used to detect faults in the system and also offer diagnoses as to their sources. This work is concerned with the monitoring of air contaminants aboard future generation spacecraft and seeks to satisfy NASA's requirements as outlined in their Strategic Plan document (Technology Development Requirements, 1996).
Derived from text
Simulation; Models; Air Pollution; Monitors; Space Stations; Air Quality

19990004396 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Design Review of the Controller-Pilot Data Link Communications Build 1 (CPDLC-1) Functionality and Computer-Human Interface for the Display System Replacement *Final Report*
Darby, Evan R., Jr.; Shingledecker, Clark; Aug. 1998; 52p; In English
Report No.(s): AD-A353997; DOT/FAA/CT-98/16; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents the results of a controller design review of the proposed functionality and computer-human interface for Controller-Pilot Data Link Communications Build 1 (CPDLC-1) planned for implementation on the Display System Replacement (DSR).
DTIC
Human Factors Engineering; Data Links; Controllers; Human-Computer Interface

19990004399 Analytic Sciences Corp., San Antonio, TX USA
Analysis of CARDlab Data for Interpupillary and Vertex Distance: Notes on the Construction of an "Eye-box" *Final Report, Aug. 1997 - Feb. 1998*
Schmeisser, Elmar T.; Maier, Dennis A.; Jul. 1998; 17p; In English
Contract(s)/Grant(s): F41624-97-D-9000; AF Proj. 7757
Report No.(s): AD-A354014; AFRL-HE-BR-TR-1998-0047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Data was obtained from the Wright-Patterson Air Force Base Computerized Anthropometric Research and Design lab (CARDLab) describing the quantitative three dimensional location of various facial landmarks. This data was compared to a set

of similar measurements made in clinical optometric practice. The values obtained were analyzed for their statistical distribution. These values can be used to predict the fit of eye centered protective eyewear designs.
DTIC
Anthropometry; Computer Programs; Ear Protectors

19990005986 Institute for Human Factors TNO, Soesterberg, Netherlands
A Digital Visual Distinctness Metric: *Interim Report Een Digitale Visuele Opvallendheidsmaat*
Toet, A., Institute for Human Factors TNO, Netherlands; Martinez-Beamo, J., Granada Univ., Spain; Jun. 08, 1998; 32p; In English; Original contains color illustrations
Contract(s)/Grant(s): A98/KL/316; TNO Proj. 786.1
Report No.(s): TNO-TM-98-A037; TD98-0246; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

This report presents a new computational visual distinctness metric based on principles of the early human visual system. The metric is applied to quantify (a) the visual distinctness of targets in complex natural scenes, and (b) the perceptual differences between compressed and uncompressed images. The new metric is shown (i) to predict human observer performance in search and detection tasks on complex natural imagery, (ii) to correlate with visual target distinctness estimated by human observers, and (iii) to correlate with the quality factor of JPEG compressed imagery.
Author
Human Performance; Estimating; Imagery

19990007754 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Electrostatic Properties of the Army Combat Soldier Ensemble Garments
Billon, H., Defence Science and Technology Organisation, Australia; Bajinskis, G., Defence Science and Technology Organisation, Australia; Apr. 1998; 44p; In English
Report No.(s): DSTO-TR-0664; DODA-AR-010-531; Copyright; Avail: Issuing Activity (DSTO, Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

The electrostatic properties of the combat ensemble worn by Australian soldiers have been assessed. The resistance-to-ground, capacitance-to-ground, peak potential, peak energy and decay times were measured for a subject wearing various garment combinations. It was found that under favourable conditions a subject wearing the garments can generate sufficient energy to initiate electro-explosive devices, damage electronic devices and ignite fuel/air mixtures. However the threat level is dependent on the operational scenario and a threat analysis is required to determine the hazard for any given situation.
Author
Electrostatics; Garments; Assessments; Potential Energy; Combat

19990007858 FGAN, Research Inst. for Electronics and Mathematics, Wachtberg-Werthhoven, Germany
Investigation of Human Performance Monitoring an IR-Camera View from an Unmanned Tactical Aircraft
Gaertner, Klaus-Peter, FGAN, Germany; Krueger, Walther, FGAN, Germany; Jul. 1998; 6p; In English; Also announced as 19990007836; Copyright Waived; Avail: CASI, A02, Hardcopy, A03, Microfiche

Man-machine system performance on target designation and tracking tasks can be influenced by the design of the manual control subsystem including characteristics of the control device. An experimental set-up simulates the control station of a human operator monitoring a computer display which shows the stabilized TV-camera view out of an unmanned aerial vehicle flying at low altitude. Using a hand-grip controlstick the operator can control the direction of the missile's camera to facilitate the designation of a target. After "lock on", further tracking of the target is made by an automatic tracking system. The operator has to monitor the tracker function and to make corrections if necessary. Target designation by the operator becomes a critical task because the camera system has a narrow field of view to enhance good recognition. Thus target images move towards display edges in a short time. So the target designation task has to be fast and reliable. to achieve near optimum operator performance three different types of control sticks are used and compared in an experiment: (1) a moveable stick (displacement), (2) a stiff stick (hybrid force), and (3) an unmoveable stick (pure force). Additionally the sensitivity, i.e. the gain of the control signal, is being varied including a non-linear relationship. Results of a test series conducted comparing linear and non-linear control gain showed no significant differences on performing the target acquisition task.
Author
Control Systems Design; Man Machine Systems; Manual Control; Operator Performance; Human-Computer Interface; Control Simulation; Control Sticks

19990007885 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
Alternative Control Technologies: Human Factors Issues (*Techniques de Pilotage Alternatives: Le Facteur Humain*)
Oct. 1998; 116p; In English; Alternative Control Technologies: Human Factors Issues, 7-8 Oct. 1998, Bretigny, Wright-Patterson AFB, OH, France, USA; Also announced as 19990007887 through 19990007895
Report No.(s): RTO-EN-3; AC/323(HFM)TP/1; ISBN 92-837-1003-7; Copyright Waived; Avail: CASI; A06, Hardcopy; A02, Microfiche

With the increasing intelligence of computer systems, it is becoming more desirable to have an operator communicate with machines rather than simply operate them. In combat aircraft, this need to communicate is made quite crucial due to high temporal pressure and workload during critical phases of the flight (ingress, engagement, deployment of self-defence). The HOTAS concept, with manual controls fitted on the stick and throttle, has been widely used in modern fighters such as F16, F18, EFA and Rafale. This concept allows pilots to input real time commands to the aircraft system. However, it increases the complexity of the pilot task due to inflation of real time controls, with some controls being multifunction. It is therefore desirable, in the framework of "ecological interfaces", to introduce alternative input channels in order to reduce the complexity of manual control in the HOTAS concept and allow more direct and natural access to the aircraft systems. Control and display technologies are the critical enablers for these advanced interfaces. There are a variety of novel alternative control technologies that when integrated usefully with critical mission tasks can make natural use of the innate potential of human sensory and motor systems. Careful design and integration of candidate control technologies will result in human-machine interfaces which are natural, easier to learn, easier to use, and less prone to error. Significant progress is being made on using signals from the brain, muscles, voice, lip, head position, eye position and gestures for the control of computers and other devices. Judicious application of alternative control technologies has the potential to increase the bandwidth of operator-system interaction, improve the effectiveness of military systems, and realise cost savings. Alternative controls can reduce workload and improve efficiency within the cockpit, directly supporting the warfighter. By the end of 1997, WG 25 had extensively reviewed human factor aspects of current and prospective alternative technologies along with operational needs and integration issues. Dissemination of the knowledge among Engineering and Human Factor communities has to be made as early as possible to facilitate implementation of these new technologies in future projects.
Author
Human Factors Engineering; Man Machine Systems; Manual Control; Artificial Intelligence; Control Equipment; Automatic Control; Control Systems Design; Real Time Operation

19990007887 Defence Evaluation Research Agency, Systems Integration Dept., Farnborough, UK
Operational Rationale and Related Issues for Alternative Control Technologies
Rood, G. M., Defence Evaluation Research Agency, UK; Alternative Control Technologies: Human Factors Issues; Oct. 1998; 8p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The demanding operations in the current generations of fixed and rotary wing aircraft, particularly at night and in poor weather, have increased the need for more 'eyes-out' operations, which decreases the time for 'head down' or 'head in' viewing time, both for switching operations and for assimilation of information from head down displays. Similarly the speed of operations has led to less time being available for these two operations. Progress has been made towards the assimilation of visual display data through the move towards Helmet Mounted Displays and the time reductions in switching have been achieved through ensuring that the pilot has no need to move his hands from the primary aircraft controls during high workload periods by the use of the Hands On Throttle And Stick (HOTAS) concept. Using Fitts Law, namely that the time to move the hand to a target (in this case a switch or button) depends only upon the relative precision required, indicates that the movement time - a summed combination of perceptual processing, cognitive processing and motor processing - is in the region of 250 ms (an aircraft moving at 500 knots travels in the region of 80 metres in this time). Thus a time saving of around 250 msec is achievable by minimising the hand movements. This generally involves the provision of all of the necessary manual switches on either the throttle top or the control column (stick) top, (HOTAS) or Hands On Collective and Cyclic (HOCAC) - for helicopters - during all critical flight operations.
Derived from text
Aircraft Control; Helmet Mounted Displays; Workloads (Psychophysiology); Flight Operations; Control Systems Design; Human Factors Engineering

19990007888 Air Force Research Lab., Information Analysis and Exploitation Branch, Wright-Patterson AFB, OH USA
The Technology of Speech-Based Control
Anderson, Timothy R., Air Force Research Lab., USA; Oct. 1998; 10p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

This lecture will present an overview of current speech recognition/control technology being utilized for aerospace applications. Common approaches in the areas of signal acquisition, signal processing, and pattern matching will be presented. Pattern matching algorithms for speech recognition/control can be characterized as pattern recognition approaches and acoustic phonetic approaches. The most common pattern recognition approaches used today are the hidden Markov model (HMM) and neural network. The strengths and weakness of the various approaches will be examined.
Author
Speech Recognition; Control Systems Design; Neural Nets; Control Equipment; Voice Control; Artificial Intelligence

19990007889 Applied Science Labs., Bedford, MA USA
Technology and Application of Gaze Based Control
Borah, Joshua, Applied Science Labs., USA; Oct. 1998; 10p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

This lecture reviews the potential use of gaze measurement as a means of human interaction with computers and other systems, especially in the military aerospace environment. It addresses the reasons for considering gaze control, reviews techniques for measuring gaze; and discusses physiological, behavioral, and practical considerations for design of gaze based controls.
Author
Control Systems Design; Human-Computer Interface; Eye Movements; Control Equipment; Active Control; Vision

19990007890 Air Force Research Lab., Wright-Patterson AFB, OH USA
The Technology and Applications of Gesture-Based Control
McMillan, Grant R., Air Force Research Lab., USA; Oct. 1998; 12p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This lecture reviews the technology for using hand, body and facial gestures as a means for interacting with computers and other physical devices. It discusses the rationale for gesture-based control technology, methods for acquiring and processing such signals from human operators, applications of these control technologies, and anticipated future developments.
Author
Control Equipment; Technology Utilization; Human-Computer Interface; Human Body; Control Systems Design

19990007891 Air Force Research Lab., Information Analysis and Exploitation Branch, Wright-Patterson AFB, OH USA
Applications of Speech-Based Control
Anderson, Timothy R., Air Force Research Lab., USA; Oct. 1998; 10p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

This lecture will examine many applications of speech based control in aerospace environments. Applications of speech recognition in fixed and rotary wing aircraft as well as in space and command and control will be discussed. Current performance of the technology and application problems will be presented. The lecture concludes with a discussion of required enhancements for aerospace applications.
Author
Speech Recognition; Voice Control; Control Systems Design; Control Equipment; Command and Control; Man Machine Systems

19990007892 Applied Science Labs., Bedford, MA USA
Technology and Application of Head Based Control
Borah, Joshua, Applied Science Labs., USA; Oct. 1998; 12p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This lecture reviews the use of head position and orientation as a means for human interaction with computers and other systems, especially in the military aerospace environment. It addresses the reasons for using head based control, current measurement technology, relevant physiological and behavioral factors, and the uses of head based control to date.
Author
Aircraft Control; Control Equipment; Control Systems Design; Automatic Control; Head Movement; Human-Computer Interface

19990007893 Air Force Research Lab., Wright-Patterson AFB, OH USA
The Technology and Applications of Biopotential-Based Control
McMillan, Grant R., Air Force Research Lab., USA; Oct. 1998; 12p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A03, Hardcopy; A02, Microfiche

This lecture reviews the technology for using electrical signals from the muscles and brain as a means for interacting with computers and other physical devices. It discusses the rationale for biopotential-based control technology, methods for acquiring and processing such signals from human operators, applications of these control technologies, and anticipated future developments.
Author
Brain; Muscles; Control Equipment; Human-Computer Interface; Control Systems Design; Electric Pulses

19990007894 Defence Evaluation Research Agency, Systems Integration Dept., Farnborough, UK
Human Factors Issues for the Integration of Alternative Control Technologies
Rood, G. M., Defence Evaluation Research Agency, UK; Oct. 1998; 8p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

The introduction of Alternative Control Technologies (ACTs), and their closer links with human natural behaviour, will require a better balance between the human factors requirements and the aircraft integration engineering issues. Successful integration of ACTs into aircraft systems should provide significant operational advantages, and the following paragraphs discuss an approach for the necessary balance of human factors and engineering.
Author
Human Factors Engineering; Aircraft Control; Control Systems Design; Human-Computer Interface; Automatic Control

19990007895 Sextant Avionique, Saint Medard en Jalles, France
Synthesis- and Expected Benefit Analysis
Leger, Alain, Sextant Avionique, France; Oct. 1998; 10p; In English; Also announced as 19990007886; Copyright Waived; Avail: CASI; A02, Hardcopy; A02, Microfiche

A synthetic approach of the various Alternative Control Technologies is proposed, taking into account advantages and inconveniences for military aircraft applications. Operational rationale, classification of technologies following capabilities and degree of maturity, summary of main functional characteristics and integration issues are critically reviewed. A brief presentation of multimodal dialog issues is also presented. Finally, a tentative investigation of potential areas of benefits for military aircraft design and operation is conducted.
Author
Control Systems Design; Human-Computer Interface; Human Factors Engineering; Aircraft Control; Automatic Control

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

19990004118 Sulfonics, Inc., Alachua, FL USA
Reconstructing Ancient Forms of Life *Quarterly Report*
Benner, Steven A., Sulfonics, Inc., USA; Mar. 10, 1998; 43p; In English; Sponsored in part by the Deutsche Akademische Austauschdienst
Contract(s)/Grant(s): NAS5-97210
Report No.(s): NASA/CR-1998-208599; NAS 1.26:208599; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Progress in the past three months has occurred in two areas, reconstruction of ancestral proteins and improved understanding of chemical features that are likely to be universal in generic matter regardless of its genesis. Ancestral ribonucleases have been reconstructed, and an example has been developed that shows how physiological function can be assigned to in vitro behaviors observed in biological systems. Sequence data have been collected to permit the reconstruction of src homology 2 domains that underwent radiative divergence at the time of the radiative divergence of chordates. New studies have been completed that show how genetic matter (or its remnants) might be detected on Mars (or other non-terrean locations.) Last, the first in vitro selection experiments have been completed using a nucleoside library carrying positively charged functionality, illustrating the importance of non-standard nucleotides to those attempting to obtain evidence for an "RNA world" as an early episode of life on earth.
Author
Life Sciences; Ribonucleic Acids; Nucleosides; Physiology; Genetics; Nucleotides

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